GE U111 ENGINEERING PROBLEM SOLVING & COMPUTATION, SPRING 2004
HOMEWORK #6 - TRAJECTORIES WITHOUT AIR FRICTION – PART II

DATE ASSIGNED:	March 15, 2004
DATE DUE:	March 22, 2004 (at the beginning of class)
READING:	Chapter 3.1-3.2 and "Trajectories without Air Friction – Part I" handout

HW 6 Prelab: Come to lab with the following Prelab worksheet assignments completed. These will be checked in lab. Read the handout entitled "Trajectories without Air Friction – Part I. Background information & Exercise 1"

P1, P2, P3: Solve by hand to find the distance x_2-x_1 at a height y=300 m for a ball projected with an initial velocity of 200 m/s at an angle of 50°. Also find the maximum height the ball reaches and the total time that the ball is in the air. On the Prelab sheet, show all formulae used and all work with interim values.

P4. In 3 places on the code to be entered as the Lab Assignment, it is indicated that commands should be filled in. For the lines in the code where you see **>>*type command here***, please write the proper commands or functions in the spaces on the worksheet by P4. This is so that you can complete the trajectory calculation code in ONE SESSION by entering the prepared commands.

Lab Work: Read this in advance. You are expected to do Exercise 1 in one lab session:

Exercise 1. Do the **MATLAB EXERCISE** on the handout Introduction to MATLAB: Trajectories with-out Air Friction: Turn in (i) the diary file and (ii) the three plots that you will produce. Save them on diskette.

- Find the MATLAB icon and open the MATLAB Application. The Command Window will open. You will begin typing in the MATLAB Command Window at the prompt **>>.**
- Follow the steps under the **MATLAB EXERCISE** title by typing exactly what you see to the right of the >> prompt. There are errors that you are intentionally directed to make so that you will see the outcome. As noted, you will skip comments that are related to the errors, and abbreviate some of the comments after commands.
- By following the instructions on the **MATLAB EXERCISE** sheet, you will begin by setting the default drive to **a:** (assuming you have a diskette in the **a** drive) and you will keep a *diary* file of your procedure. You will name the diary file by typing: **diary intro_ _ _** . Fill in the _ _ _ with your initials.
- At each prompt you should type the commands precisely as they are written. Your output should be exactly like the **MATLAB EXERCISE** code, (and most comments, and output, unless you make an error). In that case, read the error message, make the correction and continue. Do NOT start again.
- In some cases, the required commands have been replaced with ***(type command here)***. You will need to figure out what command, formula or values needs to be entered based on the comments or answer which have been returned. Also, fill in the places that say ***% Provide Comments Here %.*** There are 3 commands and 10 comments that you need to provide to complete the program. The rest is just typing and learning about MATLAB.
- ***Use a highlighter to highlight the answers that you have filled in***

Exercise 1 (continued): By design, Exercise 1 has you generate a diary file that is imperfect and long so that you can learn about MATLAB while you simultaneously write code that solves a trajectory problem. This code will then be made into an executable m-file and used to solve another trajectory problem (***Exercise 2***):

Exercise 2. Make and submit an *m-file* called `assign1.m` with all of the commands from Exercise 1 in it. You have the option of (a) writing the file from scratch **or** (b) changing a copy of the diary file.

(a) To write the m-file by starting new:

- In the Command window, choose File => New => M-file. The Editor/Debugger window will open. You may begin typing the m-file. The contents can be generated by extracting the relevant commands from the diary file (that should be executable). Then you will **Save** as `intro_ _ _.m` onto your diskette.
- Return to the Command Window and run the m-file by typing `intro_ _ _`. It should run; otherwise you will need to check for errors and make corrections in order to get the appropriate output and figures.

or

(b) To make the m-file by modifying a copy of the diary file (that should already arrive at a result):

- In the Command window, choose **File => Open =>** intro_ _ _.dia. You may have to browse for your file. Be sure to select **Files of type: All files (*.*)**.The Editor/Debugger window will then open.
- Immediately choose **Save As**: and name it `intro_ _ _.m`, and save it on your a: drive.
- You can pare down your existing diary file by cleaning it up. This involves removing all of the all of the commands that caused errors and all of the error messages and deleting any of the irrelevant output that was included as part of the **MATLAB EXERCISE** learning process. Remember your m-file must be executable, so you can only have in the m-file the commands that MATLAB can execute, and comments.
- When you're done editing, ensure that you save the file on your floppy disk in the a: drive. Run the m-file (by typing `intro_ _ _.m` in the MATLAB Command Window at the >> prompt) and verify that you get the same output and plots as you did in Exercise 1. If you get error messages, you may have removed a valid command, kept a bad command, or made a typographical error. Check your code and make the correction.

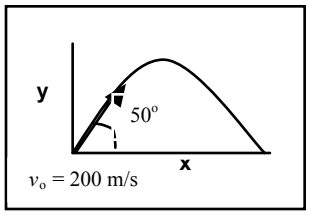
Exercise 3. Change your m-file to make the initial velocity 200 m/s and the initial angle 50^o. Turn in (i) a print-out of the streamlined m-file, (ii) the plot of the trajectory (Figure 3), and (iii) the result for x_2-x_1 at a height y=300 m. Highlight this result on the output. This should be the same as your Prelab result. Don't forget to change the Figure titles as appropriate.

What to turn in: Make a Cover page for this assignment. (Include the standard information: lab assignment title, course number and course name, lecture day and meeting time, date (due), and your name.) Also, provide an organized list of contents. Everything that is required is underlined above. Include your diskette with all of the required program files. Be sure to also email copies of these files to Stephen Frechette at sfrechet@ece.neu.edu by the start of class on the assignment due date. In the subject line, type the following: "Your last name, GE U111-Section X, HW 6".

PRELAB – HW 6 **Name:** _____

Complete this exercise and bring it to Lab. It will be checked at the beginning of Lab.

Solve by hand to find the distance x_2-x_1 at a height y=300 m for a ball projected with an initial velocity of 200 m/s at an angle of 50° (from a height of 0). Also, find the maximum height and total time that the ball is in the air. Show all formulae used and all work with interim values. Circle each solution.



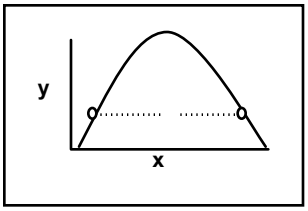
P1. Solve for the horizontal distance (x) between the two points where y = 300:

a. Formulae used: _____

_____

b. Solution: _____

_____



_____

_____

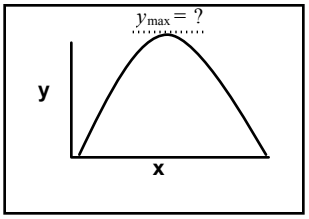
P2. Calculate the maximum height y that the ball reaches in flight:

a. Formulae used: _____

_____

b. Solution: _____

_____



_____

_____

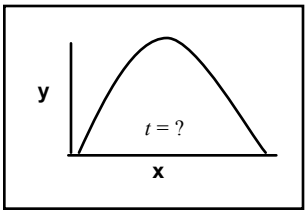
P3. Calculate the length of time that the ball is in the air:

a. Formulae used: _____

_____

b. Solution: _____

_____



_____

_____

P4. 3 Commands to be entered:

_____

_____

_____

***Remember to bring a diskette or Zip to Lab**